WEST Search History

DATE: Thursday, December 11, 2003

Set Name side by side	Query	Hit Count	Set Name result set
DB=USPT,PGPB; PLUR=YES; OP=ADJ			
L19	(4693777| 5344525| 5462892| 5554563| 5672239| 5730834| 5759334| 5830279)![pn]	8	L19
DB=USPT; PLUR=YES; OP=ADJ			
L18	5972161	5	L18
DB=USPT,PGPB,JPAB,EPAB,DWPI,TDBD; PLUR=YES; OP=ADJ			
L17	(5000682| 5378283| 5578129| 5858108| 5972161)![pn]	11	L17
L16	L15 not l14	7	L16
L15	hbr with desorb$	9	L15
L14	hbr with desorb	2	L14
L13	sti and (plasma with hbr) and (residue)	12	L13
L12	sti and (plasma with hbr) and (hbr with heat$)	1	L12
L11	((plasma with hbr) same (corros$ with hbr)) and (heat$)	12	L11
L10	((plasma with hbr) same (corros$ with hbr)) and (hbr with heat$)	0	L10
DB=USPT; PLUR=YES; OP=ADJ			
L9	(plasma with hbr) with (residue or condens$)	11	L9
L8	plasma with hbr	697	L8
L7	L4 and (fluorine with plasma with residue)	84	L7
L6	markoff and (fluorine with residue)	8	L6
L5	markoff and (fluorine residue)	1	L5
L4	L2 and heat$	248	L4
L3	L2 and (134/$.ccls. 438/906.ccls.)	0	L3
L2	plasma same fluorine same residue	368	L2
L1	5282925 and plasma	19	L1

END OF SEARCH HISTORY

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L17: Entry 7 of 11 File: DWPI Jan 21, 1998

DERWENT-ACC-NO: 1997-552884
DERWENT-WEEK: 200325

TITLE: Dry etching apparatus preventing condensation of residual reaction gas on etched wafer - includes devices for heating and activating residual gas in the etching and load-lock chambers and/or device using deionised water to clean inside of chambers.

INVENTOR: KIM, T; NOH, S ; PARK, J ; KIM, T W ; NOH, S G ; PARK, J H

PATENT-ASSIGNEE:

ASSIGNEE	CODE
SAMSUNG ELECTRONICS CO LTD	SMSU

PRIORITY-DATA: 1996KR-0018825 (May 30, 1996)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
CN 1170777 A	January 21, 1998		000	C23F001/08
GB 2313574 A	December 3, 1997		016	H01J037/32
DE 19713972 A1	December 11, 1997		007	C23F001/08
JP 10050679 A	February 20, 1998		005	H01L021/3065
KR 97077317 A	December 12, 1997		000	H01L021/3065
US 5972161 A	October 26, 1999		000	C23F001/02
US 6073636 A	June 13, 2000		000	B08B003/008
GB 2313574 B	December 6, 2000		000	H01L021/3065
KR 218269 B1	September 1, 1999		000	H01L021/3065
TW 432131 A	May 1, 2001		000	C30B033/12

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
CN 1170777A	May 9, 1997	1997CN-0111511	
GB 2313574A	March 26, 1997	1997GB-0006347	
DE 19713972A1	April 4, 1997	1997DE-1013972	
JP 10050679A	March 31, 1997	1997JP-0080938	
KR 97077317A	May 30, 1996	1996KR-0018825	
US 5972161A	April 11, 1997	1997US-0840237	
US 6073636A	April 11, 1997	1997US-0840237	Div ex
US 6073636A	December 24, 1998	1998US-0228038	
US 6073636A		US 5972161	Div ex
GB 2313574B	March 26, 1997	1997GB-0006347	
KR 218269B1	May 30, 1996	1996KR-0018825	
TW 432131A	September 26, 1996	1996TW-0111880	

INT-CL (IPC): B08 B 3/008; C23 F 1/02; C23 F 1/08; C23 F 4/00; C30 B 33/12; H01 J 37/32; H01 L 21/304; H01 L 21/3065

ABSTRACTED-PUB-NO: GB 2313574A
BASIC-ABSTRACT:

A dry etcher for etching a thin film on a wafer comprises an etching chamber (50), a reaction gas supply to the chamber (52), a load-lock chamber (60) for controlling etching atmosphere before and after loading and unloading the wafer. A gas discharger (70) is used to pump the reaction gas out of the etching and load-lock chambers and a heater device (80) e.g. a UV ray lamp for preventing any remaining residual gas in the chambers from condensing on the wafer by heating and activating it. A dry etching method carried out using the apparatus is also claimed comprising heating the residual reaction gas in the chambers after etching wafer in high vacuum to prevent condensation of residual reaction gas on a wafer when it is unloaded from the load-lock chamber and exposed to the ambient atmosphere.

ADVANTAGE- A separate device or treatment stage is not required to eliminate residual gas form the chamber which improves the yield and
ABSTRACTED-PUB-NO:

GB 2313574B
EQUIVALENT-ABSTRACTS:

A dry etcher for etching a thin film on a wafer comprises an etching chamber (50), a reaction gas supply to the chamber (52), a load-lock chamber (60) for controlling etching atmosphere before and after loading and unloading the wafer. A gas discharger (70) is used to pump the reaction gas out of the etching and load-lock chambers and a heater device (80) e.g. a UV ray lamp for preventing any remaining residual gas in the chambers from condensing on the wafer by heating and activating it. A dry etching method carried out using the apparatus is also claimed comprising heating the residual reaction gas in the chambers after etching wafer in high vacuum to prevent condensation of residual reaction gas on a wafer when it is unloaded from the load-lock chamber and exposed to the ambient atmosphere.

ADVANTAGE- A separate device or treatment stage is not required to eliminate residual gas form the chamber which improves the yield and

US 5972161A

A dry etcher for etching a thin film on a wafer comprises an etching chamber (50), a reaction gas supply to the chamber (52), a load-lock chamber (60) for controlling etching atmosphere before and after loading and unloading the wafer. A gas discharger (70) is used to pump the reaction gas out of the etching and load-lock chambers and a heater device (80) e.g. a UV ray lamp for preventing any remaining residual gas in the chambers from condensing on the wafer by heating and activating it. A dry etching method carried out using the apparatus is also claimed comprising heating the residual reaction gas in the chambers after etching wafer in high vacuum to prevent condensation of residual reaction gas on a wafer when it is unloaded from the load-lock chamber and exposed to the ambient atmosphere.

ADVANTAGE- A separate device or treatment stage is not required to eliminate residual gas form the chamber which improves the yield and

US 6073636A

A dry etcher for etching a thin film on a wafer comprises an etching chamber (50), a reaction gas supply to the chamber (52), a load-lock chamber (60) for controlling etching atmosphere before and after loading and unloading the wafer. A gas discharger (70) is used to pump the reaction gas out of the etching and load-lock chambers and a heater device (80) e.g. a UV ray lamp for preventing any remaining residual gas in the chambers from condensing on the wafer by heating and activating it. A dry etching method carried out using the apparatus is also claimed comprising heating the residual reaction gas in the chambers after etching wafer in high vacuum to prevent condensation of residual reaction gas on a wafer when it is unloaded from the load-lock chamber and exposed to the ambient atmosphere.

ADVANTAGE- A separate device or treatment stage is not required to eliminate residual gas form the chamber which improves the yield and

CHOSEN-DRAWING: Dwg.2/5

TITLE-TERMS: DRY ETCH APPARATUS PREVENT CONDENSATION RESIDUE REACT GAS ETCH WAFER DEVICE HEAT ACTIVATE RESIDUE GAS ETCH LOAD LOCK CHAMBER DEVICE DEIONISE WATER CLEAN CHAMBER

DERWENT-CLASS: L03 P43

CPI-CODES: L04-C07B; L04-D;

SECONDARY-ACC-NO:
CPI Secondary Accession Numbers: C1997-176434

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L19: Entry 2 of 2 File: USPT Jun 3, 1997

DOCUMENT-IDENTIFIER: US 5636320 A
TITLE: Sealed chamber with heating lamps provided within transparent tubes

Brief Summary Text (5):
Currently known reactors employ external heating of the chamber, by positioning heaters or lamps close to a transparent wall of the chamber. For example, U.S. Pat. No. 4,558,660 to Nishizawa, et al. entitled "Semiconductor Fabricating Apparatus" describes a quartz glass reaction tube for curing wafers in the presence of a gas, with the wafers being heated by lamps outside the reaction chamber. Cooling is provided either by channeling water through a reflective block positioned on the side of the lamps away from the chamber, or constructing a double-walled chamber and flowing a purified gas through the space in between the walls.

Brief Summary Text (6):
Other prior art using lamps external to the chamber includes: U.S. Pat. No. 5,305,416 to Fiory entitled "Semiconductor Processing Technique, Including Pyrometric Measurement of radiantly Heated Bodies;" U.S. Pat. No. 5,259,881 to Edwards, et al, entitled "Wafer Processing Cluster Tool Batch Preheating and Degassing Apparatus;" U.S. Pat. No. 5,027,746 to Frijlink entitled "Epitaxial Reactor Having a Wall Which is Protected from Deposits;" U.S. Pat. No. 4,533,820 to Shimuzu, entitled "Radiant Heating Apparatus;" U.S. Pat. No. 5,057,668 to Gisdakis, et al entitled "Device for the Implementation of a Curing Process at a Semiconductor Wafer and Method for Curing a Semiconductor Wafer;" and Japanese Patent 62-183513 to Natsuo, et al. entitled "Semiconductor Manufacturing Apparatus."

Brief Summary Text (7):
The prior art utilizes a heat source which is external to the chamber, and thus heating of the chamber is a relatively slow process. In addition, if more than a single wafer is to be processed, the wafers must be substantially coplanar so that the wafers face an array of lamps for even heating. Thus prior art methods are inefficient when large batches (for example 25 wafers in a wafer cassette) need to be processed, and processing time per wafer is very long.

Detailed Description Text (4):
Wafer processing may be accomplished via conventional means, for example as described in U.S. Pat. No. 5,282,925 to Jeng at al. entitled "Device and Method for Accurate Etching and Removal of Thin Films," which is assigned to the present assignee and is incorporated herein in its entirety. Generally, Jeng etches oxide from a wafer by admitting reactant vapor to a chamber which forms a film on a wafer. Etching is controlled by controlling the film as well as chamber temperature. After etching is complete, the resulting residue can be removed by thermal desorption.

WEST Search History

DATE: Saturday, September 27, 2003

09555488

Set Name side by side	Query	Hit Count	Set Name result set
DB=USPT,PGPB,JPAB,EPAB,DWPI,TDBD; PLUR=YES; OP=ADJ			
L21	5282925	31	L21
L20	5282925.pn.	2	L20
L19	L16 and (etching with residue)	2	L19
L18	L16 and etching	35	L18
L17	l15 with ((heating chamber) or (heating module) or (volatilization chamber))	12	L17
L16	l15 and ((heating chamber) or (heating module) or (volatilization chamber))	64	L16
L15	cluster tool	1865	L15
L14	L12 and (hf or hbr)	21	L14
L13	L12and (hf or hbr)	0	L13
L12	cluster and ((heating chamber) or (heating module) or (volatilization chamber))	198	L12
L11	claster and ((heating chamber) or (heating module) or (volatilization chamber))	0	L11
L10	L9 and heat	30	L10
L9	5235995	44	L9
DB=USPT; PLUR=YES; OP=ADJ			
L8	5235995.pn.	1	L8
L7	5235995.pn.	1	L7
L6	5288333.pn.	1	L6
L5	5268069.pn.	1	L5
L4	5235995.pn.	1	L4
L3	4749440.pn.	1	L3
DB=USPT,PGPB,JPAB,EPAB,DWPI,TDBD; PLUR=YES; OP=ADJ			
L2	markoff and haze	5	L2
L1	loadlock and (heating chamber) and etching	15	L1

END OF SEARCH HISTORY

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L1: Entry 3 of 19 File: USPT May 13, 2003

DOCUMENT-IDENTIFIER: US 6562254 B2
TITLE: Etching method

Brief Summary Text (2):
Such a method is routinely (but not exclusively) employed in the manufacture of semiconductor devices, in which a substrate such as a silicon wafer is coated with a layer of material such as silicon oxide or silicon nitride, which layer is (selectively) etched away so as to create a patterned planar device; repetitive stacked deposition and etching of layers in this manner then allows the creation of an entire integrated circuit. Depending inter alia on the material to be etched, on the composition of the substrate, and on the required etching profile, the employed etchant may, for example, be a liquid (such as aqueous HF) or a plasma (as in Reactive Ion Etching). Since the exact (microscopic) dimensions and accuracy of overlap of the various etched features can be critical to the satisfactory performance of the final product, it is often essential to be able to conduct the etching procedure with great accuracy. In particular, it is necessary to be able to etch exactly to pre-determined depths.

US Reference Patent Number (2):
5282925

US Reference Group (2):
5282925 19940200 Jeng et al. 156/646

L10: Entry 5 of 30 File: USPT Jul 15, 2003

DOCUMENT-IDENTIFIER: US 6591845 B1
TITLE: Apparatus and method for processing the surface of a workpiece with ozone

Abstract Text (1):
An apparatus for supplying a mixture of a treatment liquid and ozone for treatment of a surface of a workpiece, and a corresponding method are set forth. The preferred embodiment of the apparatus comprises a liquid supply line that is used to provide fluid communication between a reservoir containing the treatment liquid and a treatment chamber housing the workpiece. A heater is disposed to heat the workpiece, either directly or indirectly. Preferably, the workpiece is heated by heating the treatment liquid that is supplied to the workpiece. One or more nozzles accept the treatment liquid from the liquid supply line and spray it onto the surface of the workpiece while an ozone generator provides ozone into an environment containing the workpiece.

Brief Summary Text (11):
An apparatus for supplying a mixture of a treatment liquid and ozone for treatment of a surface of a workpiece, such as a semiconductor workpiece, and a corresponding method are set forth. The preferred embodiment of the apparatus comprises a liquid supply line that is used to provide fluid communication between a reservoir containing the treatment liquid and a treatment chamber housing the semiconductor workpiece. A heater is disposed to heat the workpiece, either directly or indirectly. Preferably, the workpiece is heated by heating the treatment liquid that is supplied to the workpiece. One or more nozzles accept the treatment liquid from the liquid supply line and spray it onto the surface of the workpiece while an ozone generator provides ozone into an environment containing the workpiece.

Detailed Description Text (9):
A further embodiment of a system for delivering a fluid mixture for treating the surface of a semiconductor workpiece is illustrated in FIG. 2. Although the system 120 of FIG. 2 appears to be substantially similar to the system 10 of FIG. 1, there are significant differences. The system 120 of FIG. 2 is based upon the recognition by the present inventors that the heating of the surfaces of the semiconductor workpieces 20 with a heated liquid that is supplied along with a flow of ozone that creates an ozonated atmosphere is highly effective in photoresist tripping, ash removal, and/or cleaning processes. As such, system 120 includes one or more heaters 125 that are used to heat the treatment liquid so that it is supplied to the surfaces of the semiconductor workpieces at an elevated temperature that accelerates the surface reactions. It will be recognized that it is also possible to directly heat the workpieces so as to stimulate the reactions. Such heating may take place in addition to or instead of the indirect heating of the workpieces through contact with the heated treatment liquid. For example, supports 25 may include heating elements that may be used to heat the workpieces 20. The chamber 15 may include a heater for elevating the temperature of the chamber environment and workpieces.

Detailed Description Text (12):
At step 205, heated deionized water is sprayed onto the surfaces of the semiconductor workpieces 20. The heated deionized water heats the surfaces of the semiconductor workpieces 20 as well as the enclosed environment of the chamber 15. When the spray is discontinued, a thin liquid film remains on the workpiece surfaces. If the surface is hydrophobic, a surfactant may be added to the deionized water to assist in creating a thin liquid boundary layer on the workpiece surfaces.

US Reference Patent Number (15):
5235995

US Reference Group (15):
5235995 19930800 Bergman et al.

CLAIMS:

1. An apparatus for processing a workpiece comprising: a process chamber; an ozone generator connecting to the process chamber; a workpiece holder within the process chamber, for holding the workpiece; one or more outlets in the process chamber; a steam generator connecting to the one or more outlets, with the outlets positioned to deliver steam into the process chamber, and with at least some of the steam condensing and forming a layer of liquid on the workpiece, such that ozone diffuses through the liquid layers, wherein the steam heats a surface of the workpiece thereby accelerating a reaction of ozone on the workpiece surface.

12. The apparatus of claim 1 where steam from the steam generator heats the workpiece surface temperature to greater than 100.degree. C.

14. An apparatus for processing a workpiece comprising: a process chamber; one or more steam outlets in the process chamber; a steam generator connected to the steam outlets for providing steam to the workpiece to heat a surface of the workpiece; means for providing ozone into the process chamber; and means for forming and controlling the thickness of a boundary layer of liquid formed on the workpiece surface from condensing steam, such that ozone diffuses through the liquid layer to react on the workpiece surface.

L10: Entry 7 of 30 File: USPT Dec 24, 2002

DOCUMENT-IDENTIFIER: US 6497768 B2
TITLE: Process for treating a workpiece with hydrofluoric acid and ozone

Detailed Description Text (4):
A processing solution is preferably heated and sprayed onto the wafer surface. This heats the surface of the wafer as well as the environment. If the spray is shut off, a thin liquid film remains on the wafer surfaces. However, preferably the liquid spray is continued for the duration of the chemical process step. If the wafer surface is hydrophobic, a surfactant may be added to the liquid chemical to create a thin film of liquid on the surfaces. The boundary layer of the processing solution at the wafer surface is advantageously controlled through the use of the rotation rate, the flow rate of the processing solution, and/or the injection technique (nozzle design) used to deliver the liquid (or steam) stream to the surfaces of the wafers.

Detailed Description Text (20):
Apparatus for supplying a mixture of a treatment liquid and ozone for treatment of a surface of a workpiece, such as a semiconductor workpiece, to execute the foregoing processes are set forth below. The preferred embodiment of the apparatus comprises a liquid supply line that is used to provide fluid communication between a reservoir containing the treatment liquid and a treatment chamber housing the semiconductor workpiece. A heater heats the workpiece, either directly or indirectly. Preferably, the workpiece is heated by heating the treatment liquid that is supplied to the workpiece. One or more nozzles accept the treatment liquid from the liquid supply line and spray it onto the surface of the workpiece while an ozone generator provides ozone into an environment containing the workpiece.

Detailed Description Text (33):
A further embodiment of a system for delivering a fluid mixture for treating the surface of a semiconductor workpiece is illustrated in FIG. 2. Although the system 120 of FIG. 2 appears to be substantially similar to the system 10 of FIG. 1, there are significant differences. The system 120 of FIG. 2 is based in part on the concept that the heating of the surfaces of the semiconductor workpieces 20 with a heated liquid that is supplied along with a flow of ozone that creates an ozonated atmosphere is highly effective in photoresist stripping, ash removal, and/or cleaning processes. The system 120 therefore preferably includes one or more heaters 125 that are used to heat the treatment liquid so that it is supplied to the surfaces of the semiconductor workpieces at an elevated temperature that accelerates the surface reactions. It is also possible to directly heat the workpieces to stimulate the reactions. Such heating may take place in addition to or instead of the indirect heating of the workpieces through contact with the heated treatment liquid. For example, supports 25 may include heating elements that may be used to heat the workpieces 20. The chamber 15 may include a heater for elevating the temperature of the chamber environment and workpieces.

Detailed Description Text (36):
At step 205, heated deionized water is sprayed onto the surfaces of the semiconductor workpieces 20. The heated deionized water heats the surfaces of the semiconductor workpieces 20 as well as the enclosed environment of the chamber 15. When the spray is discontinued, a thin liquid film remains on the workpiece surfaces. If the surface is hydrophobic, a surfactant may be added to the deionized water to assist in creating a thin liquid boundary layer on the workpiece surfaces. The surfactant may be used in connection with hydrophilic surfaces as well.

Corrosion inhibitors may also be used with the aqueous ozone, thin boundary layer process.

Detailed Description Text (44):
In the described processes, elevated temperatures are used to accelerate the reaction rates at the wafer surface. One manner in which the surface temperature of the wafer may be maximized is to maintain a constant delivery of heated processing liquid, such as water or steam, during the process. The heated processing liquid contacts and heats the wafer during processing. However, such a constant delivery may result in significant waste of the water or other processing liquid. In order to conserve water and achieve the thinnest possible boundary layer, a "pulsed flow" of liquid or steam may be used. In instances in which such a "pulsed flow" fails to maintain the requisite elevated wafer surface temperatures, an alternative manner of maintaining the wafer surface temperature may be needed. One such alternative is the use of a "hot wall" reactor that maintains the wafer surface and processing environment temperatures at the desired level. To this end, the process chamber may be heated by, for example, one or more embedded heated recirculating coils, a heating blanket, irradiation from a thermal source (e.g., and infrared lamp), etc.

Detailed Description Text (82):
Additionally, once the steam ceases to condense on the wafer surface, the reaction environment experiences the elimination of an energy source to drive the reaction kinetics. As steam condenses on the wafer surface, it must relinquish the heat of vaporization, which is approximately 540 calories per gram. This energy then becomes available to promote other reactions such as the oxidation of carbon compounds in the presence of ozone or oxygen free radicals.

Detailed Description Text (84):
To accomplish this, the wafer surface must be maintained at a temperature lower than that of the steam delivered to the process chamber. This may be achieved by attaching the wafer to a temperature-controlled surface or plate 350 which will act as a heat sink. This surface may then be temperature controlled either through the use of cooling coils, a solid-state heat exchanger, or other means.

Detailed Description Text (88):
This process enables the use of temperatures greater than 100 C. to promote reaction kinetics in the water/ozone system for the purpose of removing organic or other materials from a surface. It helps ensure the continuous formation of a condensate film by preventing the surface from achieving thermal equilibrium with the steam. It also takes advantage of the liberated heat of vaporization in order to promote reaction rates and potentially allow the removal of more difficult materials which may require more energy than can be readily delivered in a hot water process.

US Reference Patent Number (8):
5235995

US Reference Group (8):
5235995 19930800 Bergman et al.

L10: Entry 14 of 30 File: USPT Aug 14, 2001

DOCUMENT-IDENTIFIER: US 6273108 B1
TITLE: Apparatus and method for processing the surface of a workpiece with ozone

Abstract Text (1):
An apparatus for supplying a mixture of a treatment liquid and ozone for treatment of a surface of a workpiece, and a corresponding method are set forth. The preferred embodiment of the apparatus comprises a liquid supply line that is used to provide fluid communication between a reservoir containing the treatment liquid and a treatment chamber housing the workpiece. A heater is disposed to heat the workpiece, either directly or indirectly. Preferably, the workpiece is heated by heating the treatment liquid that is supplied to the workpiece. One or more nozzles accept the treatment liquid from the liquid supply line and spray it onto the surface of the workpiece while an ozone generator provides ozone into an environment containing the workpiece.

Brief Summary Text (14):
An apparatus for supplying a mixture of a treatment liquid and ozone for treatment of a surface of a workpiece, such as a semiconductor workpiece, and a corresponding method are set forth. The preferred embodiment of the apparatus comprises a liquid supply line that is used to provide fluid communication between a reservoir containing the treatment liquid and a treatment chamber housing the semiconductor workpiece. A heater is disposed to heat the workpiece, either directly or indirectly. Preferably, the workpiece is heated by heating the treatment liquid that is supplied to the workpiece. One or more nozzles accept the treatment liquid from the liquid supply line and spray it onto the surface of the workpiece while an ozone generator provides ozone into an environment containing the workpiece.

Detailed Description Text (9):
A further embodiment of a system for delivering a fluid mixture for treating the surface of a semiconductor workpiece is illustrated in FIG. 2. Although the system 120 of FIG. 2 appears to be substantially similar to the system 10 of FIG. 1, there are significant differences. The system 120 of FIG. 2 is based upon the recognition by the present inventors that the heating of the surfaces of the semiconductor workpieces 20 with a heated liquid that is supplied along with a flow of ozone that creates an ozonated atmosphere is highly effective in photoresist stripping, ash removal, and/or cleaning processes. As such, system 120 includes one or more heaters 125 that are used to heat the treatment liquid so that it is supplied to the surfaces of the semiconductor workpieces at an elevated temperature that accelerates the surface reactions. It will be recognized that it is also possible to directly heat the workpieces so as to stimulate the reactions. Such heating may take place in addition to or instead of the indirect heating of the workpieces through contact with the heated treatment liquid. For example, supports 25 may include heating elements that may be used to heat the workpieces 20. The chamber 15 may include a heater for elevating the temperature of the chamber environment and workpieces.

Detailed Description Text (12):
At step 205, heated deionized water is sprayed onto the surfaces of the semiconductor workpieces 20. The heated deionized water heats the surfaces of the semiconductor workpieces 20 as well as the enclosed environment of the chamber 15. When the spray is discontinued, a thin liquid film remains on the workpiece surfaces. If the surface is hydrophobic, a surfactant may be added to the deionized water to assist in creating a thin liquid boundary layer on the workpiece surfaces.

US Reference Patent Number (12):
5235995

US Reference Group (12):
5235995 19930800 Bergman et al.

CLAIMS:

2. The apparatus of claim 1 where the liquid supply source is a liquid reservoir, and where the heater heats the liquid in the reservoir.

3. The apparatus of claim 1 wherein the heater heats the liquid at the liquid supply source or in the liquid flow line.

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L1: Entry 8 of 19 File: USPT Apr 25, 2000

DOCUMENT-IDENTIFIER: US 6054328 A
TITLE: Method for cleaning the surface of a dielectric

Detailed Description Text (15):
In a preferred embodiment, the gas reactant is HF. In a more preferred embodiment the gas reactant is a mixture of HF and NH.sub.3. The gas reactant can be introduced into the chamber in a number of ways. The source could be separate gaseous sources of HF and NH.sub.3. Alternatively, the gas reactant could be in the form of a plasma discharge in precursor gases that decompose to produce appropriate levels of HF and NH.sub.3. For example, NF.sub.3 and H.sub.2 produce HF and NH.sub.3. The discharge could be in the same chamber but would preferably be upstream of the chamber.

US Reference Patent Number (5):
5282925

US Reference Group (5):
5282925 19940200 Jeng et al. 156/646